NON-PUBLIC?: N
ACCESSION #: 8909120444
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Quad Cities Unit One PAGE: 1 OF 04

DOCKET NUMBER: 05000254

TITLE: Reactor Scram From an Induced Voltage Due to a Loose Wire on the Condenser Low Vacuum Pressure Switch Indicating Lamp
EVENT DATE: 06/29/89 LER #: 89-010-01 REPORT DATE: 08/29/89

OPERATING MODE: 4 POWER LEVEL: 094

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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Technical Staff Engineer, Ext. 2147

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: JJ COMPONENT: CON MANUFACTURER: G080
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On June 29, 1989, Quad Cities Unit One was in the RUN mode at 94 percent of rated core thermal power. At 2239 hours, a reactor scram occurred due to turbine stop valve closure. The stop valve closure was the result of a turbine trip. All safety feature actuations occurred as designed. Emergency Notification System (ENS) notification was completed at 2330 hours on June 29, 1989, to comply with the requirements of 10 CFR 50.72(b)(2)(ii).

An investigation revealed the cause for this event was a loose connection on the 1-5600-PS-105B condenser low vacuum pressure switch indicating lamp. When the lens cover for the lamp was put on, the loose wire induced a voltage in the K2D18 relay and energized the master trip bus. This resulted in a turbine trip.

2221H

END OF ABSTRACT

PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 MWt rated core thermal power.

EVENT IDENTIFICATION: Reactor Scram from an Induced Voltage Due to a Loose Wire on the Condenser Low Vacuum
Pressure Switch Indicating Lamp

A. CONDITIONS PRIOR TO EVENT:

Unit: One Event Date: June 29, 1989 Event Time: 2239
Reactor Mode: 4 Mode Name: RUN Power Level: 94%

This report was initiated by Deviation Report D-4-01-89-058.

RUN Mode (4) -In this position the reactor system pressure is at or above 825 psig, and the reactor protection system is energized, with APRM protection and RBM interlocks in service (excluding the 15% high flux scram).

B. DESCRIPTION OF EVENT:

On June 29, 1989, Quad Cities Unit One was in the RUN mode at 94 percent of rated core thermal power. At 2239 hours, a reactor scram JC! occurred due to turbine stop valve (SV)V!TG! closure. The stop valve closure scram signal comes from any turbine trip TRB!TA! when greater than 45 percent of rated steam flow as measured by turbine first stage pressure. The first hit panel showed that the trip signal was from low condenser vacuum. The expected reactor water level transient due to the collapse of voids following the scram caused reactor vessel level to drop below +8 inches which caused Group II and III Primary Containment Isolations (PCI)JC!, Reactor Building Ventilation VI! and Control Room Ventilation Isolations, and Standby Gas Treatment BH! initiation.

Additionally, a Group I PCI was received after the scram resulting in the Main Steam Isolation Valves (MSIV) closing. A high reactor pressure scram signal was received after the Group I signal. At 2245 hours, the Nuclear Station Operator (NSO) initiated procedure QOS 250-1, Pressurizing the Main Steam Lines Following a Group I Primary Containment Isolation, for opening the MSIVs to return reactor pressure control to the turbine bypass valves. At 2249 hours, reactor pressure reached 1,100 psig and the 1-203-3C Electromatic Relief Valve (ERV)RV! opened,

as designed, to reduce reactor pressure. The MSIVs were being opened as the ERV opened; thus, reactor pressure was reduced quickly to within operating range and the ERV reset properly.

An Emergency Notification System (ENS) notification of the event was completed at 2330 hours on June 29, 1989, to comply with the requirements of 10 CFR 50.72(b)(2)(ii).

2221H

Following the reactor scram, the Instrument Maintenance (IMD) and Operating Departments began a detailed investigation that included inspecting the Electro Hydraulic Control (EHC) panel, reviewing the sequence of events computer printout, and interviewing various workers. Because of the similarities of this event and an event which occurred on December 5, 1988, precursors and results of the events were compared in an attempt to provide a possible explanation. Since the low condenser vacuum trip signal was received first, the IMD personnel performed a vacuum calibration and functional test and leak tested the sensor lines under Work Request Q75383. In addition, they checked for grounds and cycled the 125 volt mercury-wetted relays associated with the trip logic while monitoring their performance on test equipment. All of the tests were concluded satisfactorily. During discussions with Operating personnel, it was determined that during both scrams, personnel were near the low condenser vacuum pressure switch indicating lights on the 901-7 panel. At the time of this scram, an electrician was replacing the lens cover for the 1-5600-PS-1058 low condenser vacuum pressure switch (PS105B) indicating light. Further investigation found that a connection on the PS105B indicating light was loose, which, when moved, caused a low condenser vacuum signal and subsequently a turbine trip. The connection for the PS105B indicating light was tightened, and further testing of the lead could not duplicate the turbine trip signal. All the connections associated with the EHC System in the 901-7 and 901-31 panels were checked for tightness on July 1, 1989. The low vacuum indicating light connection was the only identified loose connection.

At 1924 hours, on July 2, 1989, the Unit One NSO commenced reactor start-up, and at 1043 hours, on July 3, 1989, the main generator was synchronized to the grid.

C. APPARENT CAUSE OF EVENT:

This event is being reported according to 10 CFR 50.73(a)(2)(iv), which requires the reporting of any event or condition that results in manual

or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS).

The cause of this event was a loose wire connection. Investigation determined that when the wire for the indicating light was moved, a turbine trip signal was received. Testing performed by station and General Electric (GE) personnel showed that when the wire for the PS105B indicating light was moved, a 38 volt D.C. (VDC) potential occurred across relay K2D18 in the 901-31 panel. The K2D18 relay energizes the master trip bus and trips the turbine on low condenser vacuum. Although there is not a direct electrical connection between the pressure switch indicating light and the K2D18 relay, discussions with GE Engineering in Schenectady, New York, confirmed that the most probable cause for the scram was the induced voltage caused by the loose connection.

The Group I PCI appears to be a result of rack vibration caused by steam impact on the stop valves. The Group I signal on low reactor pressure was received seven-tenths of a second after the reactor scram. The high reactor pressure scram was received two-tenths of a second after the Group I isolation. Therefore, because it is unlikely reactor pressure increased over 200 psig in two-tenths of a second, the most likely cause of the Group I signal was the vibration of instrument rack 2251-1. This rack includes the Group I main steam line low pressure switches. Also, the scram results log computer printout and the reactor pressure chart recorder indicated that reactor pressure did not drop below 930 psig during the transient. Vibration isolators are scheduled to be installed on the pressure switches during the next refuel outage. Vibration isolators have been already installed on the Unit Two main steam line low pressure switches.

D. SAFETY ANALYSIS OF EVENT:

The safety significance of this event is minimal. All expected ESF actuations occurred as designed to bring the reactor to a safe shutdown condition. The turbine stop valve scram occurs when the stop valves are less than 90% full open. This scram is intended to prevent exceeding the minimum critical power ratio (MCPR) safety limit by anticipating the rapid increase in pressure, neutron flux, and heat flux which results from a fast closure of the turbine stop valves. If the turbine stop valve scram had failed, a reactor scram would still have occurred from an Average Power Range Monitor (APRM) high neutron flux.

E. CORRECTIVE ACTIONS:

The immediate corrective action was to tighten the indicating light connection and to verify all other wire connections associated with the EHC System in the 901-7 and 901-31 panels were tight.

Subsequent corrective actions will include checking the tightness of all the wire connections associated with the EHC System on the Unit Two 902-7 and 902-31 panels to eliminate the possibility of an inadvertent turbine trip (NTS 2542008905801). Additionally, as an enhancement to preclude possible equipment outages or other types of events including scrams, the wire connections in the control panels 901-3, 4, 5, 6, 7, and 8 and 902-3, 4, 5, 6, 7, and 8 will be inspected for loose fit during their next refuel outages (NTS 2542008905802).

The connections are being inspected for loose fit based upon information obtained from the IM Department. The lug screw connection for the low condenser vacuum pressure switch indicating light had loosened so substantially that it was believed to be an isolated incident. Based upon this and no other loose connections being found on the panels already inspected, a one-time inspection is planned. The inspection results of the panels will then be reviewed and a determination made at that time as to whether tightening and/or preventive maintenance need be addressed.

F. PREVIOUS EVENTS:

Although there have not been any documented scrams that were a result of an induced voltage caused by a loose connection, it is now believed that the event on December 5, 1988 (LER 88-16, Reactor Scram Due to Stop Valve Closure From a Turbine Trip - Cause Undetermined), was the result of this same condition. At the time of this event, Operating personnel were near the low condenser vacuum indicating lights on the 901-7 panel. Multiple functional tests performed following the event showed no apparent cause; however, the electrical connections behind the 901-7 panel were not tested.

G. COMPONENT FAILURE DATA:

There was no component failure associated with this event.

2221H

Commonwealth Edison

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RLB-89-185

August 29, 1989

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Reference: Quad Cities Nuclear Power Station
Docket Number 50-254, DPR-29, Unit One

Enclosed is Licensee Event Report (LER) 89-010, Revision 01, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(iv): The licensee shall report any event or condition that resulted in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS). This revision was initiated in order to resubmit the original report which may have had a page of the report inadvertently omitted at the time of transmittal. We regret any inconvenience this may have caused.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION

R. L. Bax
Station Manager

RLB/AAF/ad

Enclosure

cc: R. Stols
R. Higgins
INPO Records Center
NRC Region III

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